

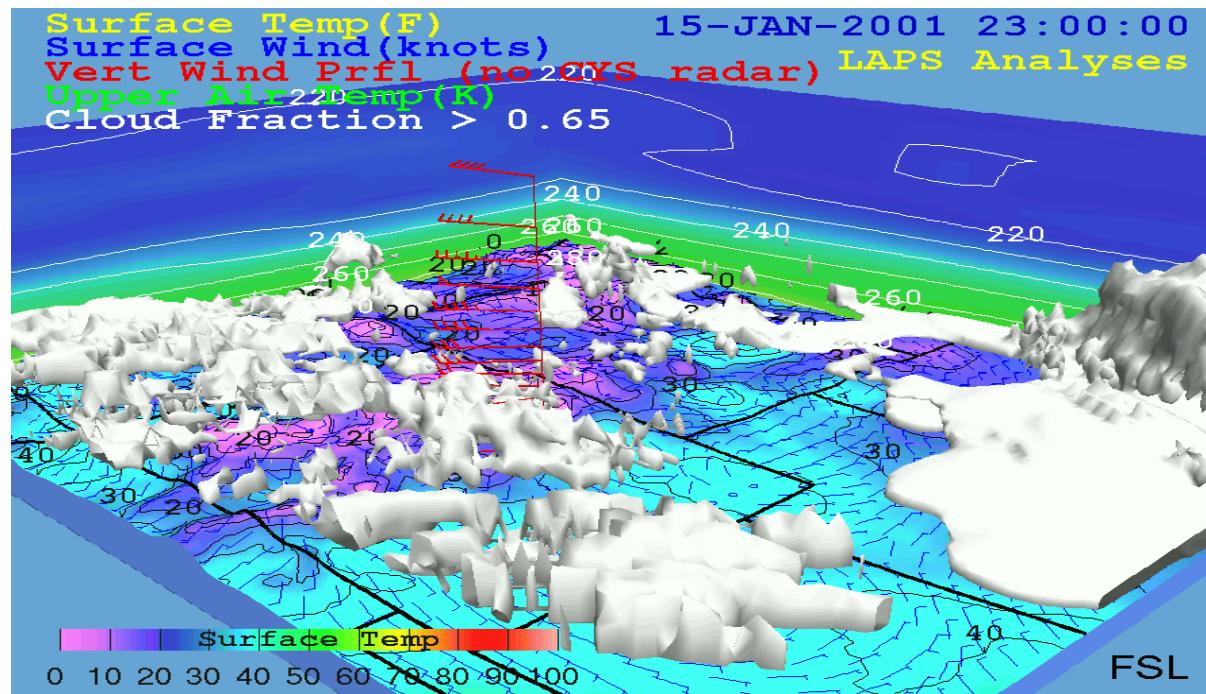
Recent Updates to LAPS

Steve Albers¹, Yuanfu Xie, Hongli Jiang¹, & Zoltan Toth

Global Systems Division
NOAA/OAR/ESRL

¹ CIRA at GSD

Acknowledgements:
FAB



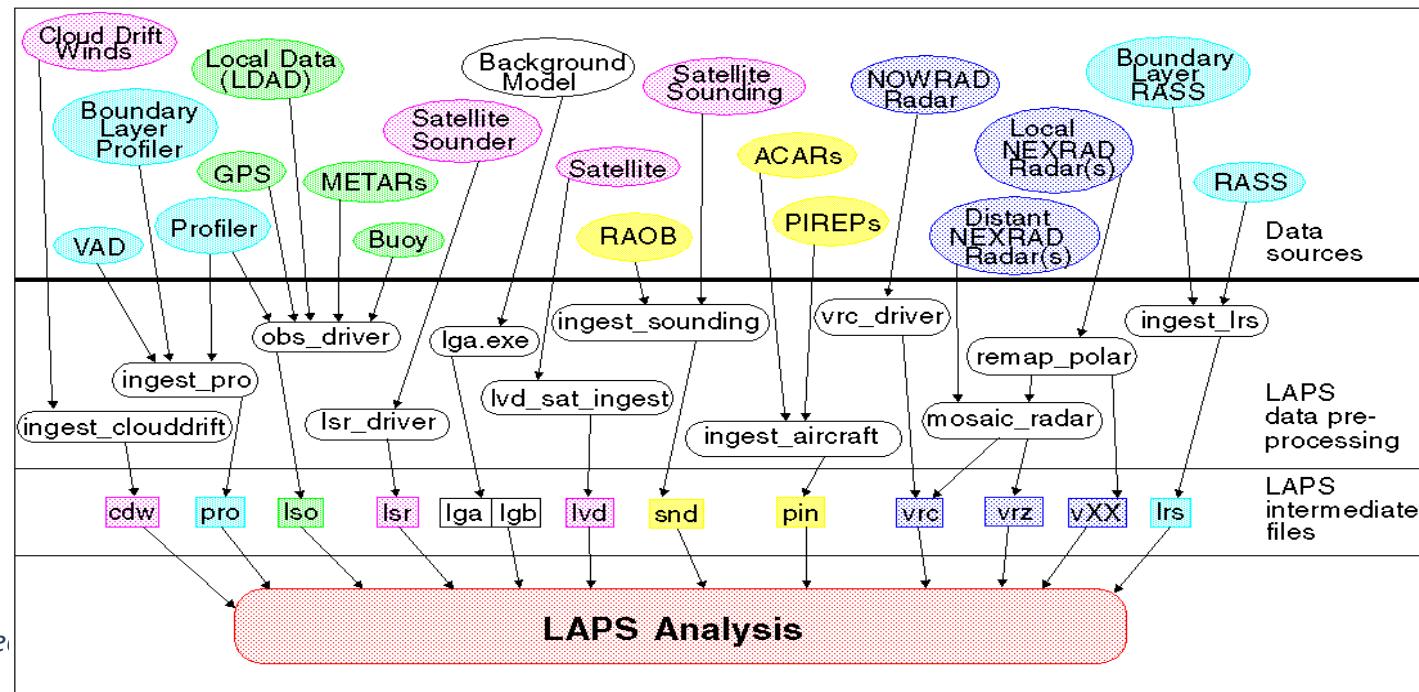
LAPS Motivation

High Resolution (500m – 20km), rapid update (10-60min)

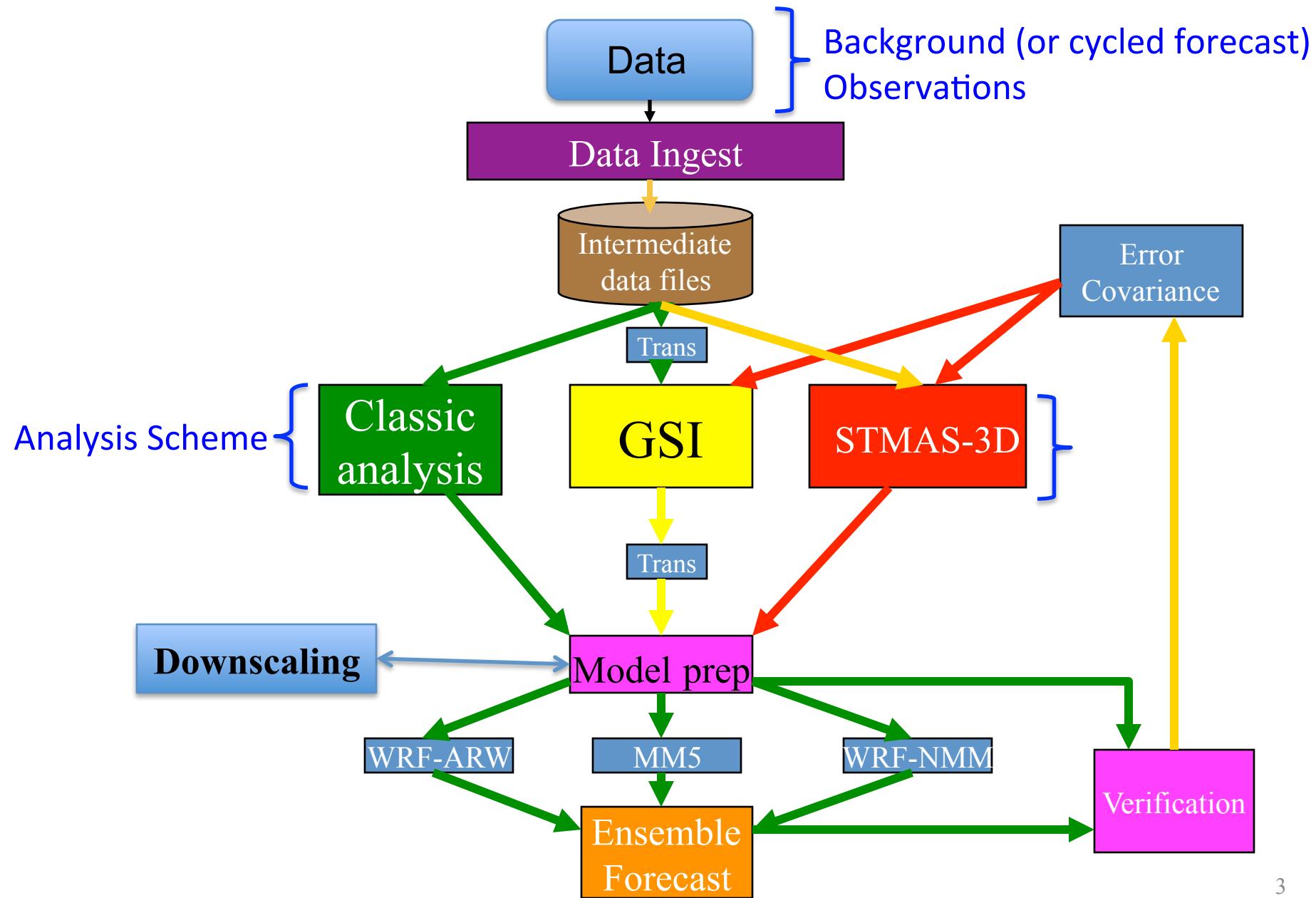
Highly portable system – about 150 users world wide

- Federal Gov't – NWS, RSA, PADS, FAA, DHS
- State Gov't – California Dept of Water Resources
- International – Finnish Met. Inst., China Heavy Rain Inst.
- Global analysis – used by SOS

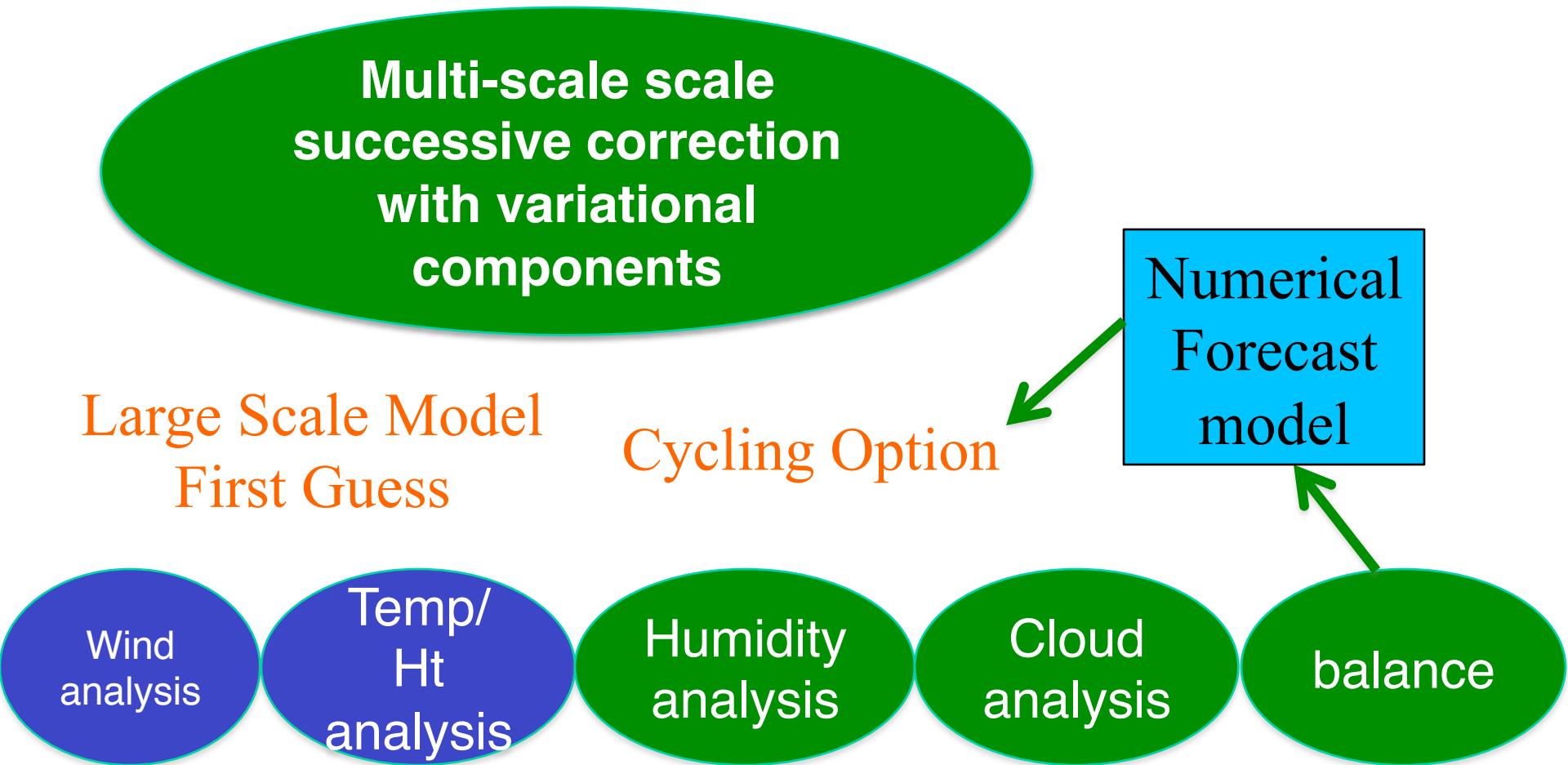
Wide variety
of data sources:



LOCAL ANALYSIS & PREDICTION SYSTEM (LAPS)

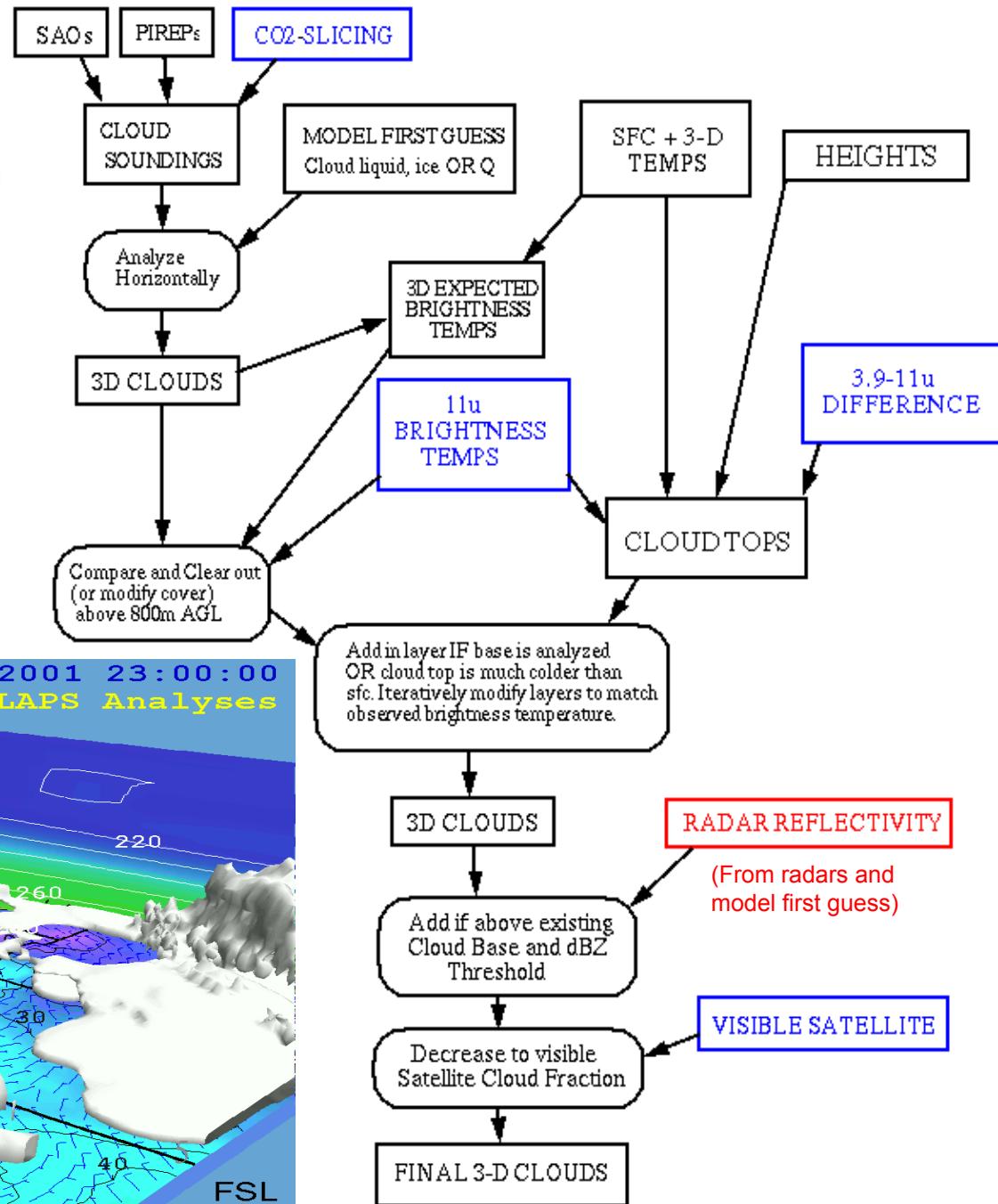
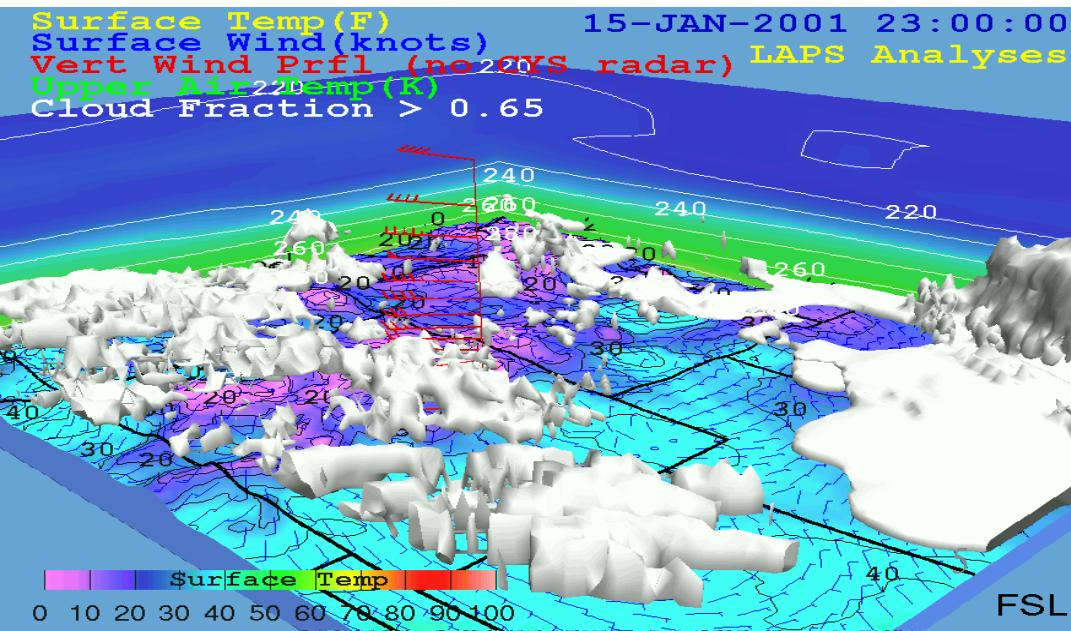


“Traditional” LAPS Analysis Steps



Cloud Analysis Flow Chart

Cloud Fraction 3-D
Isosurface



Data Acquisition Improvements

- ❑ Wideband Radar now processed from Volume Files
- ❑ Java Satellite Interface now available
- ❑ MADIS Hydro and HADS data now supported
- ❑ Improved surface obs QC (e.g. stuck temperature/wind)

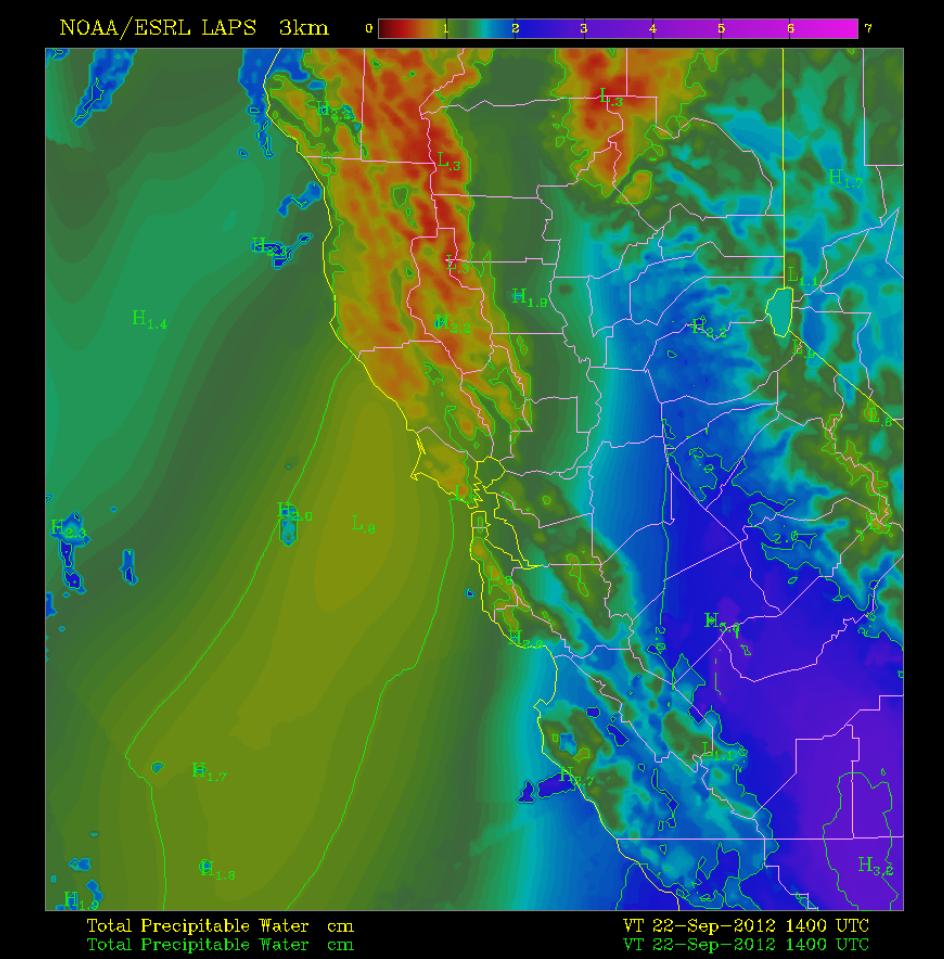
Analysis Improvements

- ❑ Sigma-Height grid now supported in LGA
- ❑ Temperature/height adjustment
 - Balance package improvements
- ❑ Variational Analysis now available
 - (see Yuanfu Xie's presentation)

Cloud Analysis Improvements

- ❑ Improved vertical placement of cloud layers
 - Cost function used with initial IR insertion
 - Improved QC and LCL checks for satellite, METARs, and radar
 - 3-D cloud field more consistent with humidity field, cloud data, and humidity data
- ❑ Hydrometeor assimilation / post-processing
 - Improved for clouds and precipitation
 - More consistent with WRF microphysics
- ❑ Use first guess radar reflectivity in data sparse regions
- ❑ Improved ground clutter rejection

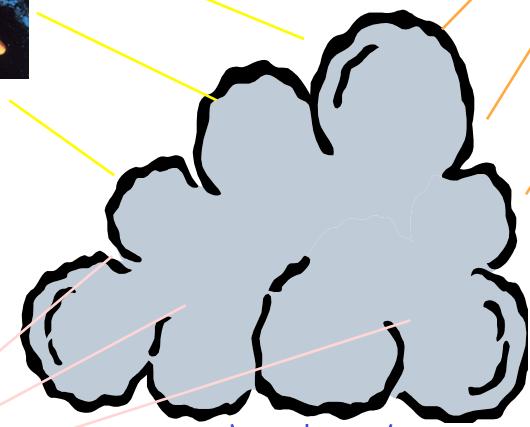
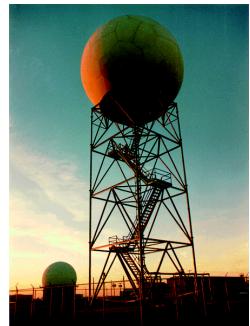
Impact of IR cost function improvement



- Improved vertical placement of cloud layers
 - First 4 hours have misplaced clouds and too much humidification
 - Clouds and humidity are corrected for the last 3 hours
 - 3-D cloud field now more consistent with humidity field, cloud data, and humidity data

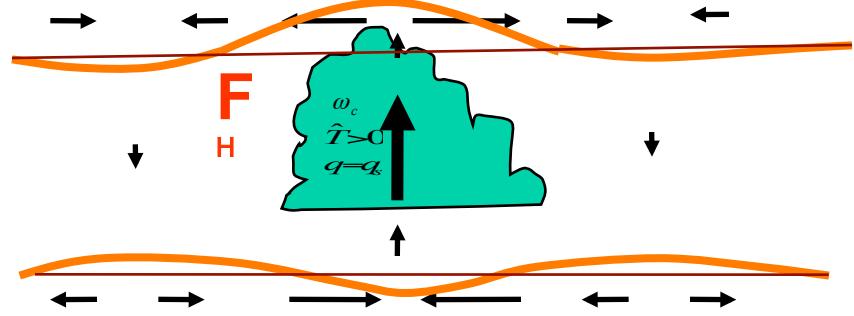
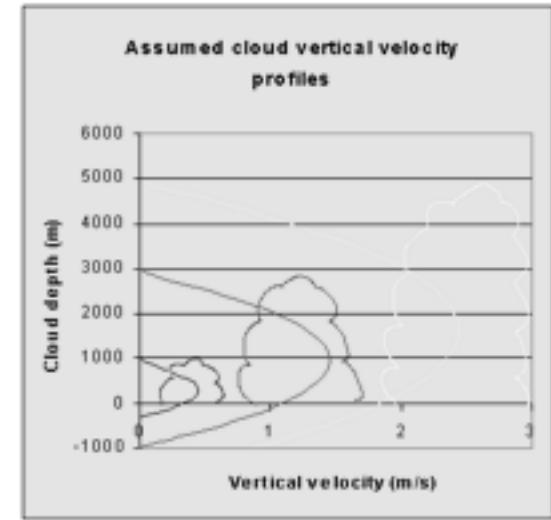
LAPS HOT-START INITIALIZATION

Three-Dimensional Cloud Analysis



METAR

+ FIRST GUESS



Diabatic Initialization Components and Recent Improvements

- ❑ Vertical velocity/horizontal divergence
 - Vertical motion now relates to both cloud depth and radar reflectivity
- ❑ Temperature/height adjustment
 - Balance package improvements
- ❑ Hydrometeor assimilation / post-processing
 - Improved for clouds and precipitation
 - More consistent with model microphysics
- ❑ Consistent water vapor and microphysical fields

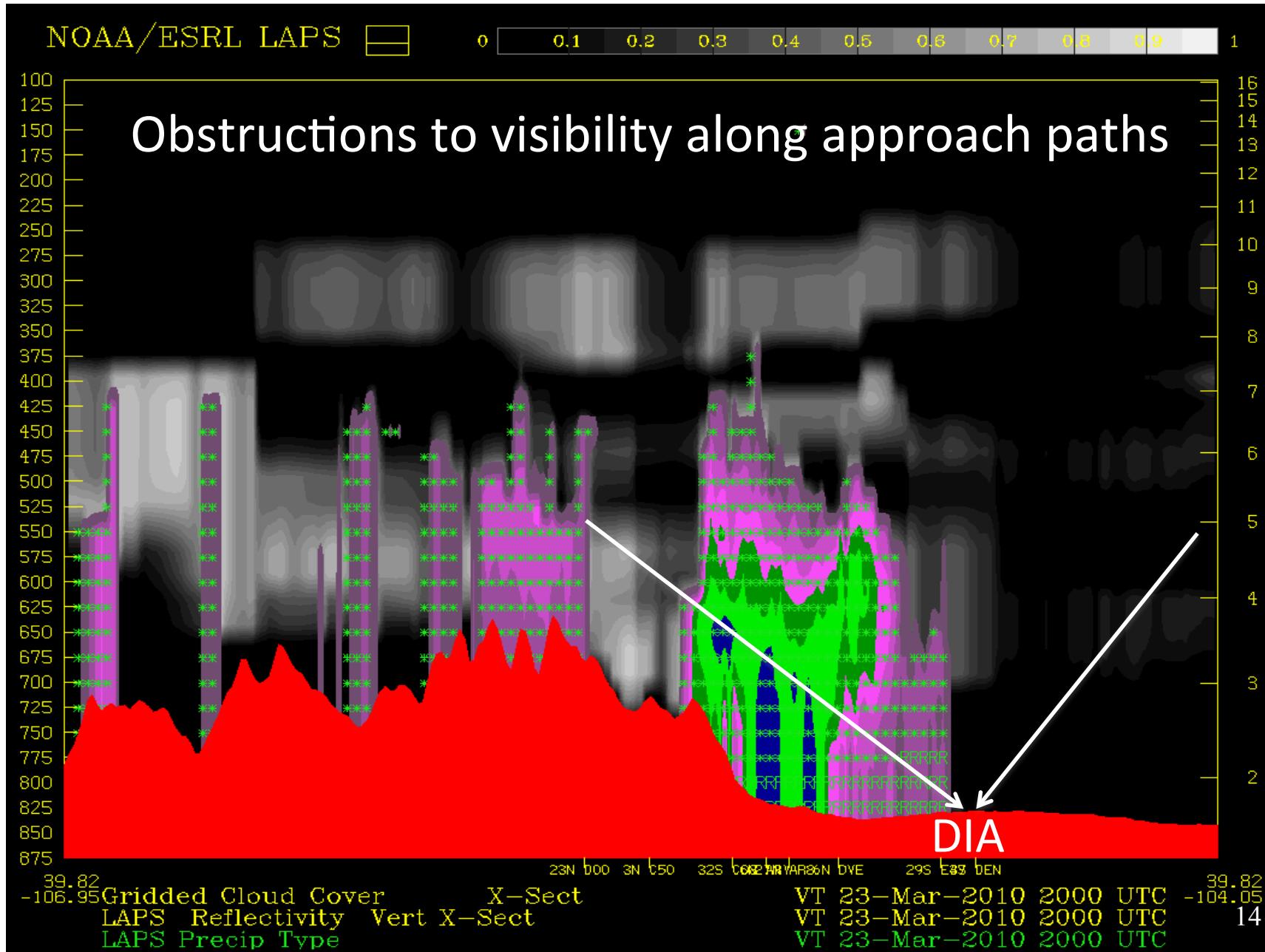
Cloud Forecast Improvements

- ❑ Forecast IR satellite field
- ❑ Forecast Solar Radiation (GHI) field
- ❑ Improved Forecast cloud amount

General Improvements

- ❑ On-the-fly Page Improved
 - More gridded and observational variables
 - Animated Montages
- ❑ Improved efficiency for large domains
- ❑ Portability improved for GFORTRAN & LAHEY
- ❑ Variety of other improvements listed in LAPS Forum
 - Listed for each software release

Cloud / Reflectivity / Precip Type (1km 15-min analysis)



Verification Package now built into LAPS

❑ Variables

- Radar Reflectivity (Composite & 3-D Volume Thresholds)
- Solar Radiation, Wind, Temperature, Precip
- Integrated Water Vapor, IR Satellite

❑ Comparing against

- Observations, Analyses, Other models (e.g. Advection, Persistence, HRRR, etc.)

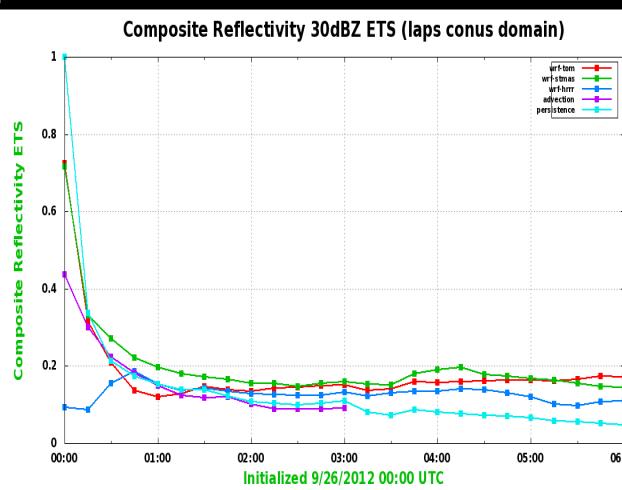
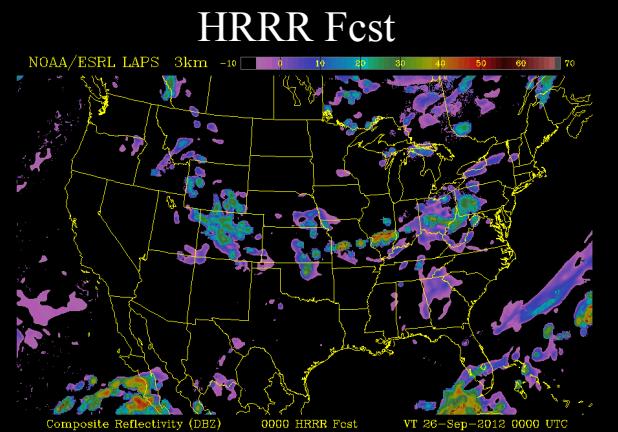
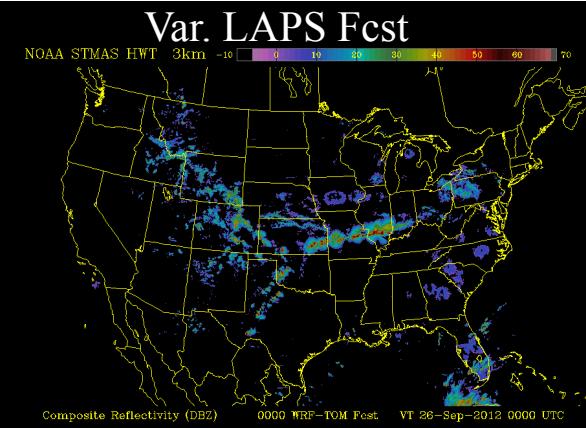
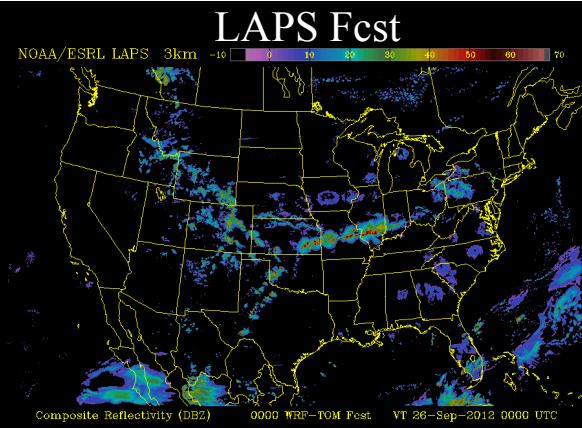
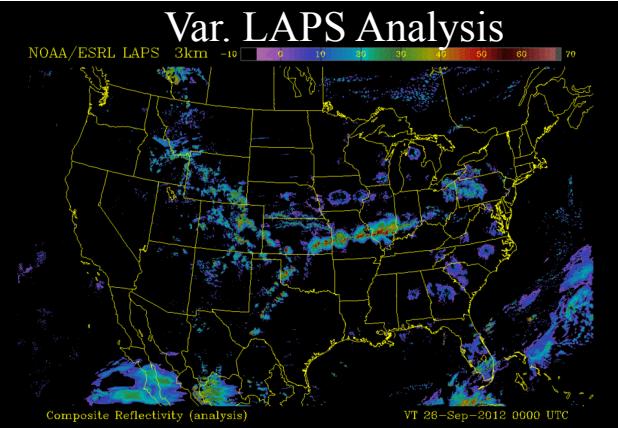
❑ Results

- Higher (better) ETS with reflectivity forecasts
- Promising results for solar radiation

❑ Explanation/interpretation

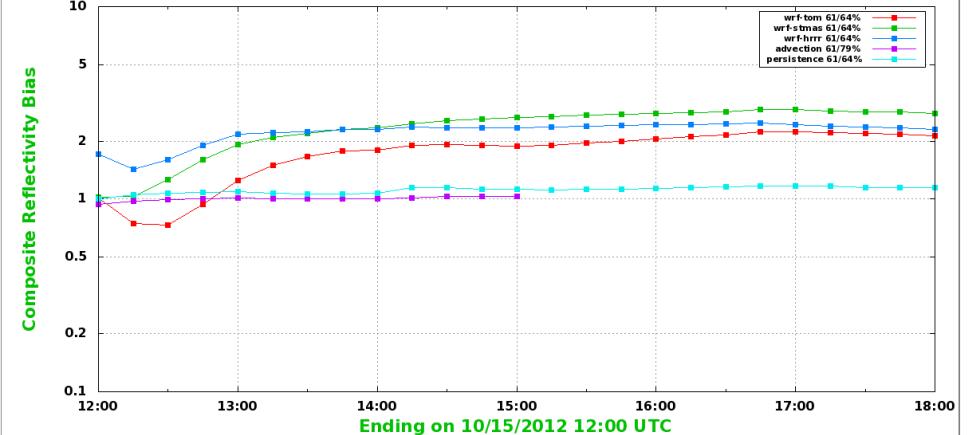
- LAPS initialization has added forecast benefit

0-6h Radar Forecast Sep 26 2012 00Z

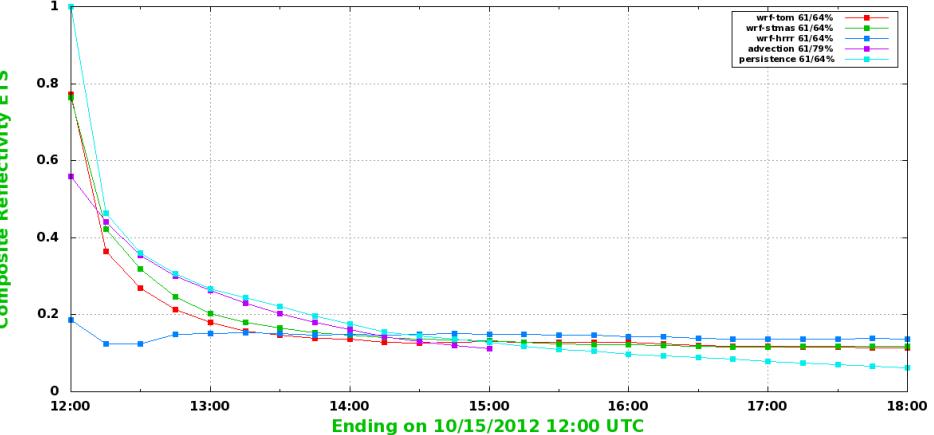


Higher ETS (best at short leads)

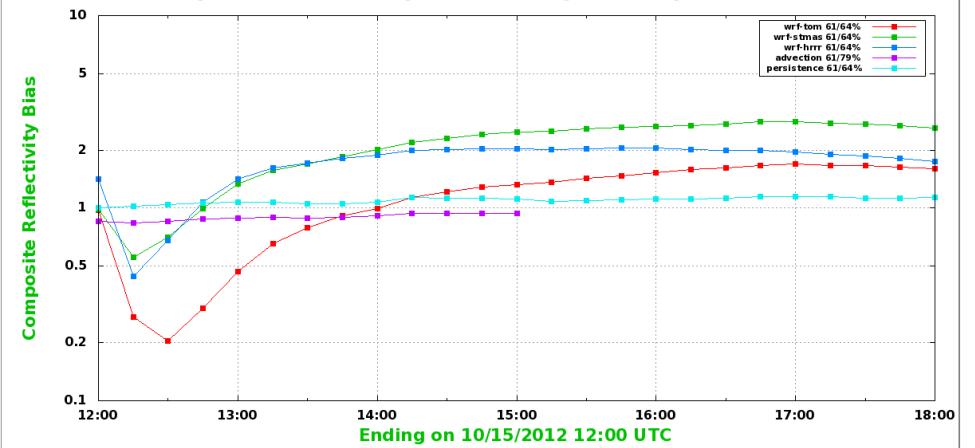
Composite Reflectivity 20dBZ 7-day Bias (laps conus domain)



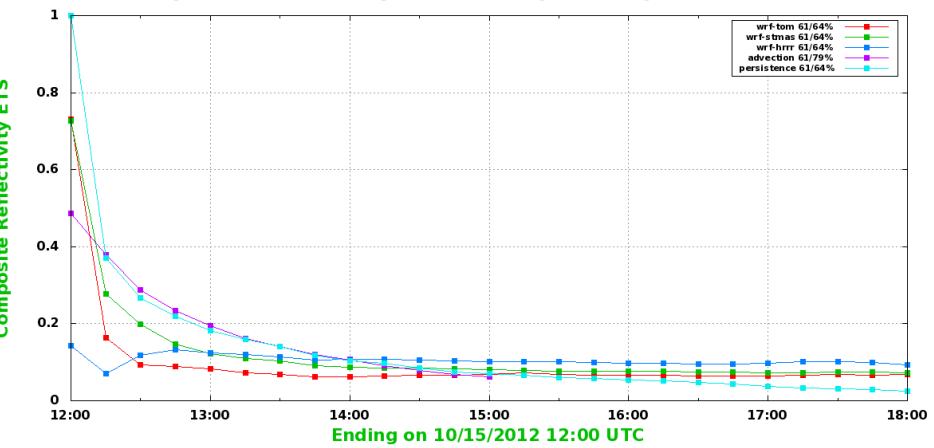
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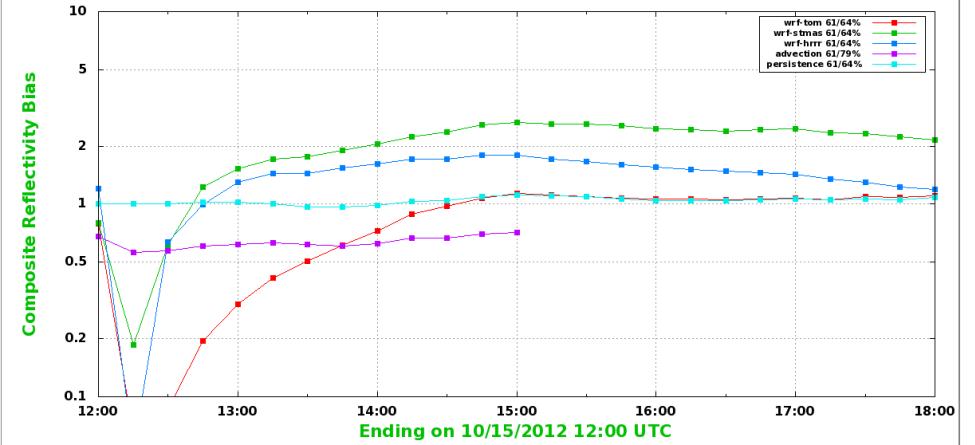
Composite Reflectivity 30dBZ 7-day Bias (laps conus domain)



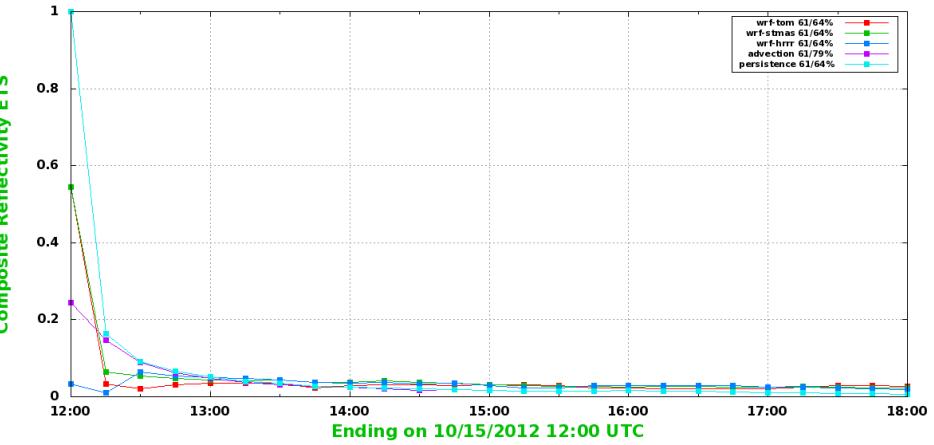
Composite Reflectivity 30dBZ 7-day ETS (laps conus domain)

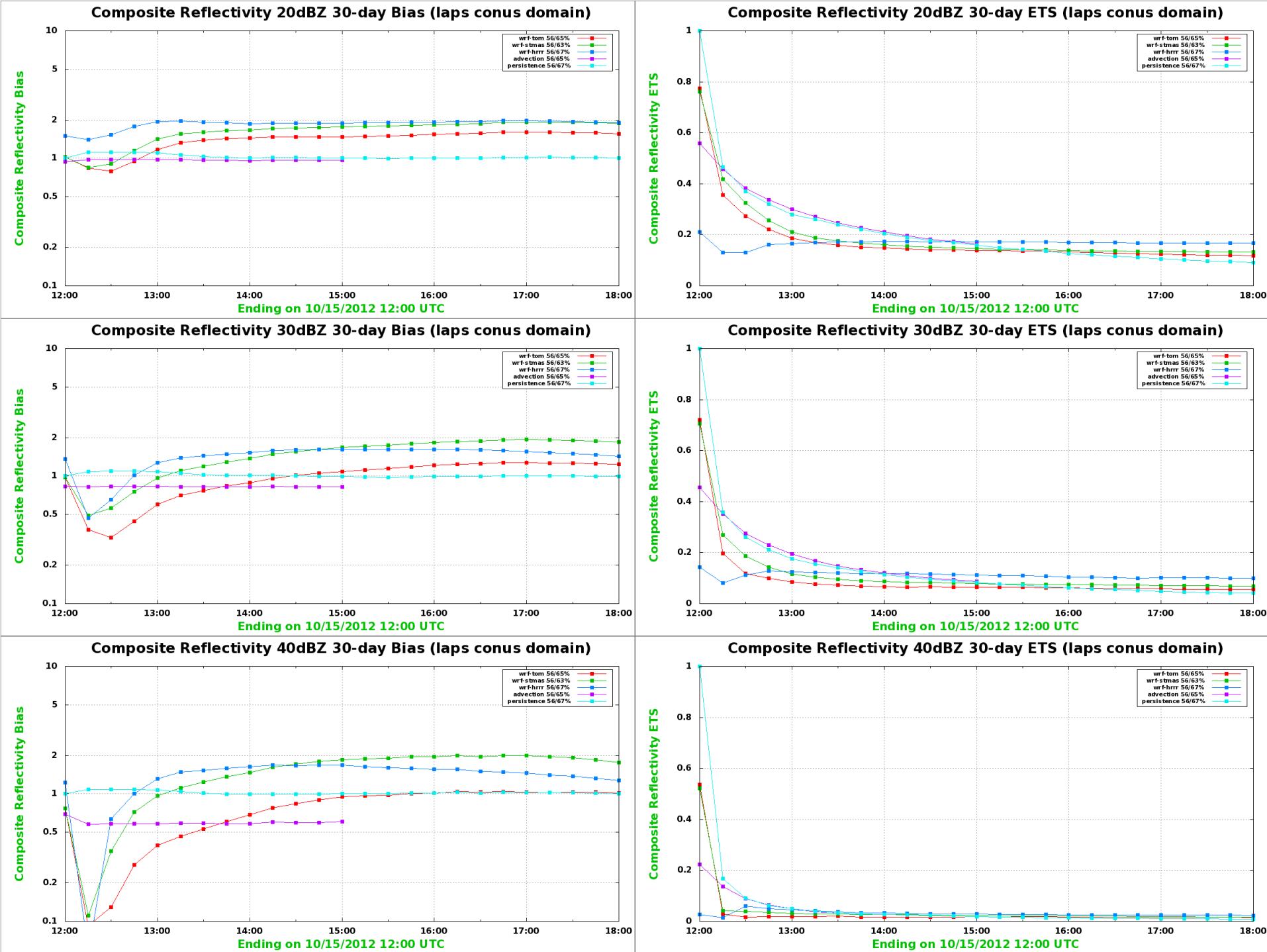


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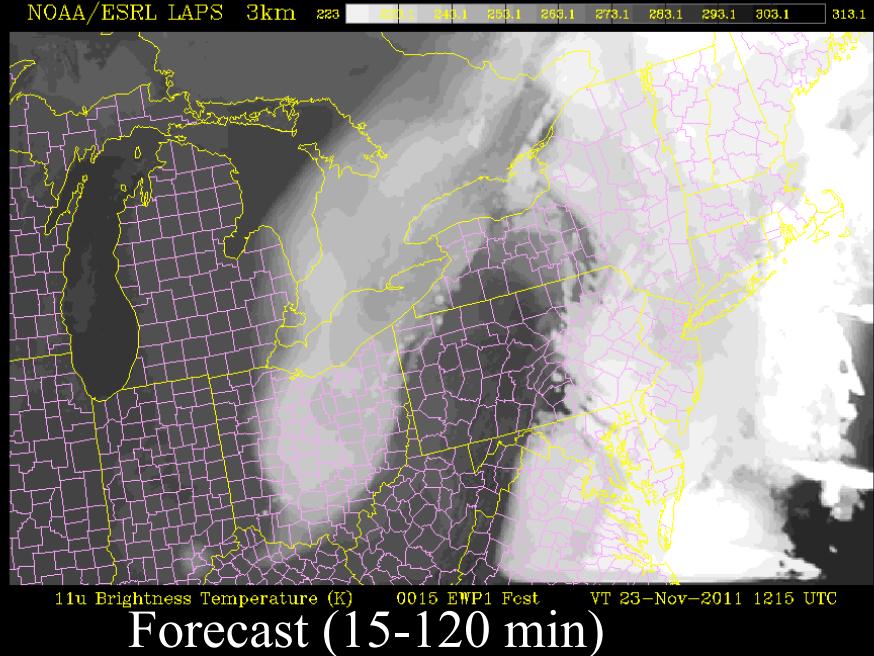
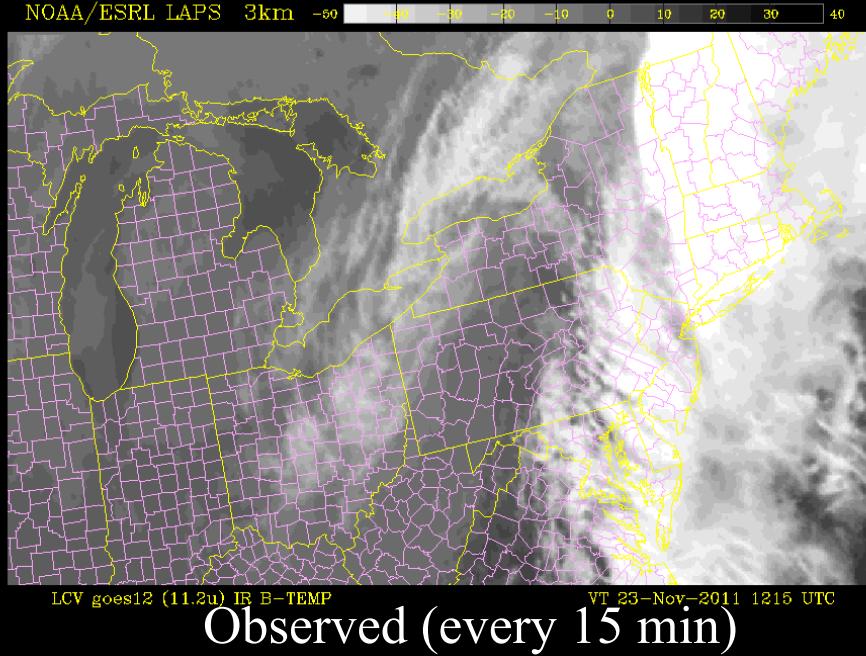


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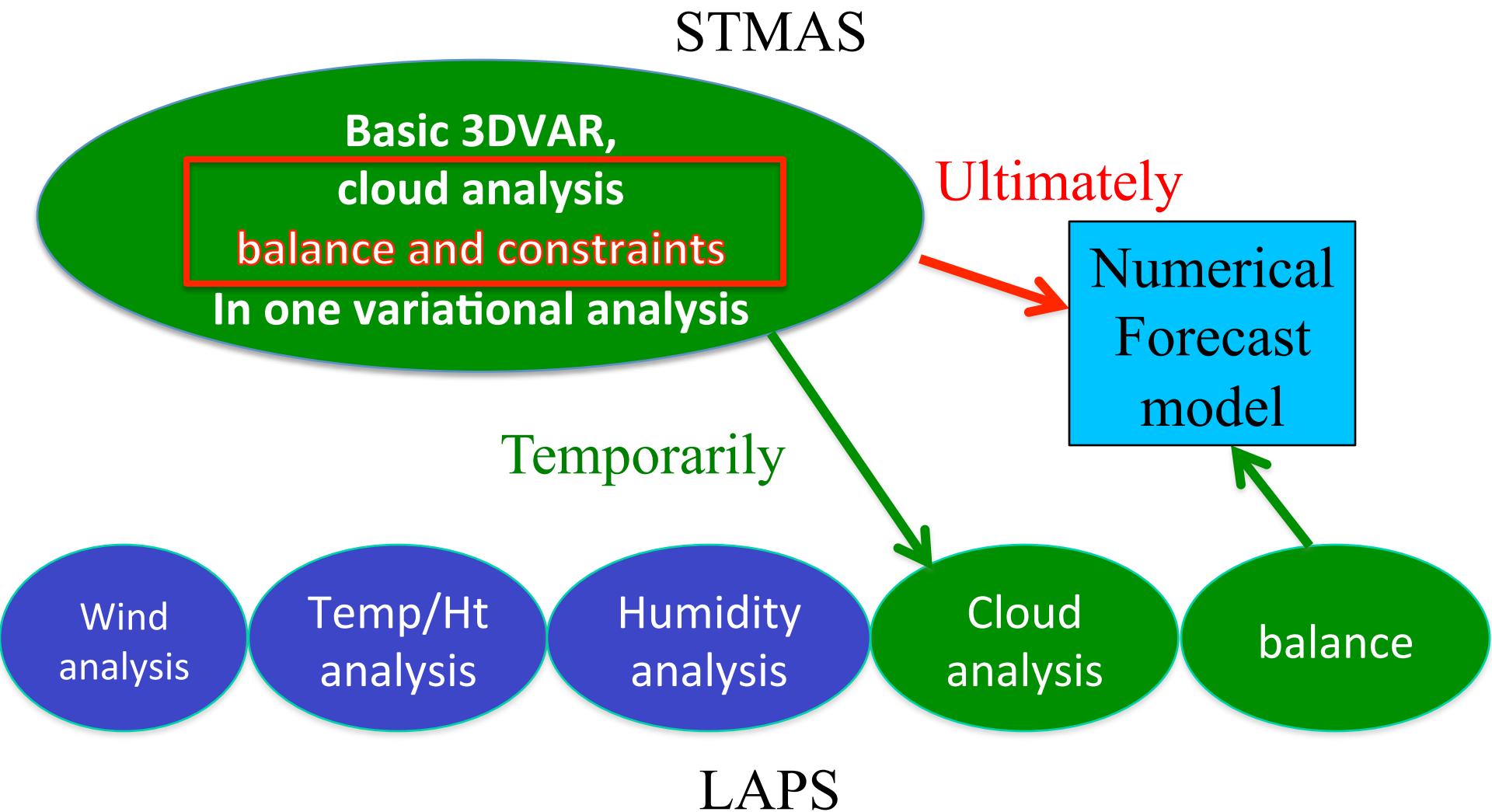


Simulated IR Satellite Forecast



- Simulated VIS also available – derived from cloud amount
- Forecasters are naturally familiar with satellite images
- Used for objective cloud forecast verification

Making LAPS more variational (STMAS)



The End

Questions?

More info at <http://laps.noaa.gov>